A Vision for the Future of Materials Discovery and Development

The Georgia Institute of Technology is among the world's premier research universities, with a reputation built upon game-changing ideas that transform the human condition and drive economic growth. Finding solutions to the grand challenges of the 21st century requires thinking big. To this end, we are pursuing a multidisciplinary, collaborative approach. This fosters a materials innovation ecosystem that builds on our core strengths in materials and adds various elements of data sciences, multiscale computational modeling and simulation, innovative schemes for synthesis, processing, characterization and property/response measurement, scale-up manufacturing, and verification and validation. Emphasis is placed on high throughput methods to accelerate materials discovery and development.

The Institute for Materials was conceived in 2012, building on the foundation of a materials research and education community comprised of more than 200 faculty members across various academic units within the Colleges of Engineering and the Sciences, also involving the Georgia Tech Research Institute.

Specific goals include:

• Develop and nurture the materials innovation ecosystem at Georgia Tech to tackle 21st century grand challenges of major economic and societal importance.
• Enrich and grow the resource base for Georgia Tech Materials research by both increasing the number of large-scale interdisciplinary research centers and the level of industry and government engagement via strategic collaborative partnerships.
• Project thought leadership of the materials community by increasing our external visibility through national and international materials initiatives, as well as leadership in scholarship and science and technology frontiers.
• Prepare the workforce of the future for materials discovery and development by promoting and facilitating more closely integrated partnerships between advanced materials and manufacturing processes, critical for strengthening the nation’s competitiveness in the global marketplace.

...in Biomaterials

• Tissue repair and regeneration
• Coatings to modulate homeostasis and delivery of biotherapeutics
• Bio-enabled materials synthesis and processing
• Bio-inspired design

The IMAT Team

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The Mint Report

The Institute for Materials shares the vision for a future of materials discovery and development for the Institute for Materials.

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The demand for better, more highly functional, sustainable and cost-effective materials is growing exponentially. Meeting this demand requires teaming across disciplines, even those beyond the traditional materials community.

Georgia Tech's Institute for Materials Innovation Initiative (IMat) represents the interests of one of the nation's largest academic materials research communities at Georgia Tech through its success in leadership in building an extensive and integrated materials research and education ecosystem. IMat is the lead institution in the Multi-Campus Consortium on Advanced Imaging and Analytics and leads the Materials Characterization Facility.

Materials Innovation

Our Materials Innovation Initiative seeks to build on Georgia Tech's core strengths to identify emergent areas of research leadership, spur development and integrate with materials informatics. Support is provided for faculty development and integrate with materials data sciences and informatics. The centerpiece of IMat's materials informatics strategy is the creation of a consolidated, large scale, interdisciplinary, large-scale proposal development initiative:

**Collaboration in Materials + X to foster disruptive innovation**

**Integrative linkages to shared resources**

**Strategic partnerships with industry, academia and government**

We invite a “Materials + X” strategy, recognizing that new and improved materials enable solutions to grand challenge problems in energy, mobility, security, health, sustainability, communications and infrastructure, among others. These issues are complex and vast in scope, demanding an innovative approach to networking and team building across disciplines at Georgia Tech and other academic institutions, also involving industry and government stakeholders. IMat takes the lead in organizing teams and providing support for large cross-cutting proposal development.

Building a Materials Innovation Ecosystem

IMat is building the materials innovation ecosystem at Georgia Tech.

**EXPERTISE**

**More than 200 faculty**

**from 3 colleges**

**13 academic units involved**

**$2.8 million awarded**

in materials informatics and data sciences from the NSF as an IGERT (www.flamel.gatech.edu), a joint effort with the College of Computing.

The Next Frontier

Since its inception in 2012, IMat continues to evolve by seeking new and innovative opportunities to further build the materials innovation ecosystem at Georgia Tech.

- **Future workforce development**
- **Strategic partnerships with industry**
- **Advancing the materials science and engineering education and training pipeline**
- **Building a Materials Innovation Ecosystem**

**EXPERTISE**

**$1.12 million**

**Center for Understanding and Control of Acid Gas-Induced Evolution of Materials for Energy from DOE, led by CNBE**

**$150 million value**

**Facilitated submitting proposals exceeding**

**$1 million**

**awarded on new full TRIP grant**

from ARPA-E, lead by MGSE

**E X P E R T I S E**

**… in Materials for Energy and Sustainability**

- **Electrodes for energy applications**
- **Materials and interfaces for catalysis, separation, storage and environmental applications**
- **Forest biomass and lignocellulosic materials**

**E X P E R T I S E**

**… in Materials for Electronics, Communications and Computing**

- **Novel graphene structures**
- **Organic and inorganic photonics and electronics**
- **Nanomaterials, nanostructured materials and devices**
- **Materials for energy harvesting and self-powered sensors**

**E X P E R T I S E**

**… in Mobility, Infrastructure and Security**

- **Lightweight materials**
- **Materials for propulsion systems**
- **Materials in elevated temperature, irradiated and corrosive environments**

**3rd campus-wide web-based research equipment search capability**

**1st in proposals submitted, including collaborations with other IIs, such as the Manufacturing Institute, the Strategic Energy Institute, and the Institute for Electronics and Nanotechnology**

**Acid Gas-Induced Evolution of Materials for Energy from DOE, led by CNBE**

**E X P E R T I S E**

**Acid Gas-Induced Evolution of Materials for Energy from DOE, led by CNBE**

**Building a Materials Innovation Ecosystem**

IMat represents the interests of one of the nation's largest academic materials research communities at Georgia Tech through its success in leadership in building an extensive collaborative network. The goal is to pursue the integration of computational materials science, data and information sciences, and experiments to accelerate the pace of discovery and development of new and improved materials. This is accomplished through the U.S. Materials Genome Initiative (MGI) and the initiative on Integrated Computational Materials Engineering. IMat has collaborated on national research projects in addressing the science and technological challenges (co-founding the Materials Accelerator Network) and with the University of Wisconsin–Madison and the University of Michigan. IMat has hosted both regional and national MGI workshops.